MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 1, 2017/2018

ECE3156 – SOFTWARE ENGINEERING

(EE, CE)

23 OCTOBER 2017
9:00 AM – 11:00 A.M
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 7 printed pages only (including this page).
2. This is a closed book exam.
3. There are **FOUR (4) QUESTIONS** in this paper. **Answer ALL questions**. All questions carry equal marks (25 marks) and the distribution of the marks for each question is given.
4. Write your answers in the Answer Booklet provided.
5. State all assumptions clearly.

Question 1

Table Q1 describes the activity network information of a particular software engineering organization, for a project that they are working on.

Table Q1: Activity network information.

Activity	Description	Preceding Activity	Activity Time (days)
A	Requirements gathering	—	4
B	Project plan	A	6
C	Design plan	A	20
D	Quality Assurance plan	A, B	3
E	Test plan	B, C	4
F	Design and Test approval	B, C, D	5
G	Development	F	35
H	Testing & Rework	E, G	20

(a) By using the information in Table Q1, draw a network diagram for the listed activities using Activity on Node (AON) method.

[4 marks]

(b) Redraw the network diagram based on the information in Table Q1 using the Activity on Arrow (AOA) method.

[6 marks]

(c) With reference to part (b), compute any slack time that exists in the individual activities with the following guidelines:

i. You are not needed to redraw the AOA diagram. Instead, draw the necessary Earliest Start Time (EST) and Latest Finish Time (LFT) boxes on the current AOA diagram of part (b).

ii. Compute the Available Time (AT) for each activity followed with the slack time, if any.

[8 marks]

(d) With reference to part (b), identify all of the possible critical paths for this project.

[2 marks]

(e) Draw the corresponding Gantt chart for the activities of this project based on a waterfall cycle.

[4 marks]

(f) Compute the durations (in days) of this project.

[1 mark]

Continued...

Question 2

(a) List four (4) levels of testing for a conventional software.

[4 marks]

(b) Explain the concepts and characteristics of non-incremental design in integration testing.

[4 marks]

(c)

```
LN1:  float testMethod (float m, float n, int *pAns)
LN2:  {
LN3:        float res = 0.0;
LN4:        if(m < -4.5 && n < -2.9) {
LN5:              return -2.0;
LN6:        }
LN7:        else {
LN8:              float q = m + pow(n, 3) * 6.8;
LN9:              float s = 0.0;
LN10:             while (s < q) {
LN11:                   res = (res * q) / (m * n);
LN12:                   s++;
LN13:             }
LN14:             *pAns = res;
LN15:       }
LN16:       return 0;
LN17: }
```

Figure Q2: Code snippet.

Figure Q2 shows a C language code excerpt for a particular function in a program. Construct a flowgraph to illustrate the control structures in this function.

[10 marks]

(d) From part (c), calculate the cyclometric complexity of the flowgraph drawn using the node/edge calculation technique.

[2 marks]

(e) Using the value calculated in part (d), list down all the possible paths that should be tested to ensure complete control structure testing.

[2 marks]

(f) Briefly describe the concept of Stress Testing, Performance Testing & Security Testing.

[3 marks]

Continued...

Question 3

(a) Briefly explain the following design terms:

i. Procedural-level design

ii. Component-level design

iii. Deployment-level design

[3 marks]

(b) A software organization is assigned to develop an Inventory Management System (IMS) to keep a record of the pharmaceutical items used within the pharmacy. An inventory administrator, a group of pharmacist and a purchasing executive will use this system. Description of this software system is as follows.

- The inventory administrator, pharmacist and purchasing executive are able to view all available chemical items for usage, and the quantity per item.
- The inventory administrator can add and remove pharmacist/purchasing executive from this system.
- The inventory administrator and the purchasing executive can add, delete or modify pharmaceutical items.
- The inventory administrator and scientists can check out a pharmaceutical item for usage.
- The purchasing executive can update the number of items per chemical component. ***Note:*** The inventory administrator and pharmacist do not have this privilege.
- The purchasing executive receives a text alert if a particular pharmaceutical item goes out of stock.

Draw a UML use case diagram for this system.

[8 marks]

(c) The following scenario is described:

Computerized Healthcare Management System

- The local government is currently accepting new enrolments for healthcare policies.
- The government provided enrolment into several policies (e.g., child-care, adult, elderly, and disabled). These policies are advertised to the public.
- Interested citizens can select a policy to enrol. A citizen can only select one policy.
- The government then allocates an appointment with the nearest local hospital of an enrolled citizen based on the selected health care policy. A medical officer is assigned to conduct preliminary health screening of the enrolled citizen.
- Each policy can be assigned to multiple local hospitals and each hospital

Continued...

can be assigned with multiple policies.

- Each policy can have many medical officers and each medical officer can be assigned to multiple policies.
- After the preliminary health screening, the enrolled citizens' results are updated for further assessment before the policy is formally endorsed.

The government would like to computerize the major operations as described above.

i. List the major entities of this scenario above. For each entity, specify at least two useful attributes. ***Note:*** Use a table to list the entities and corresponding attributes.

[6 marks]

ii. Draw the Entity-Relationship Diagram (ERD) based on the information given using the Chen model. Specify the connectivities. However, there is no need to specify the cardinalities.

[8 marks]

Continued...

Question 4

(a) Briefly describe the following object oriented concepts.

i. Abstraction

ii. Modularity

iii. Encapsulation

iv. Polymorphism

[4 marks]

(b)

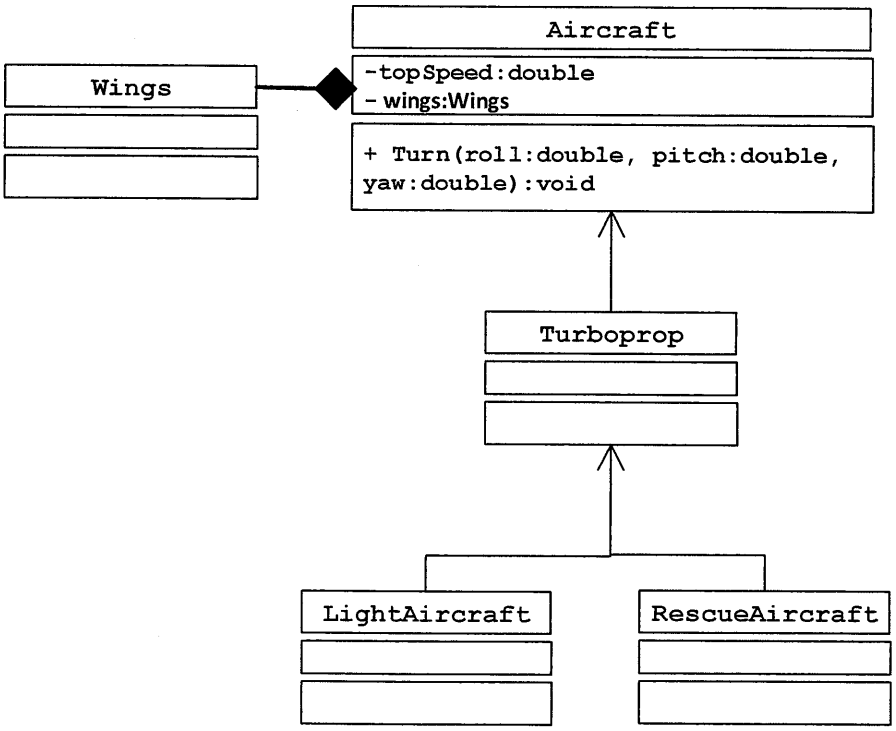

Figure Q4: UML class diagram of a train system.

Figure Q4 illustrates a Unified Modelling Language (UML) class diagram of an aircraft system.

This diagram illustrates interactions between object classes in describing a software implementation of an aircraft system. Answer the following:

i. Determine the object classes of this system.

[5 marks]

ii. Describe the relationship between the classes in Figure Q4.

[4 marks]

Continued...

iii. A new class, **Turbofan** is to be added into Figure Q4. This class is inherited from class **Aircraft**. This class also has two new member functions, which are **IncreaseByPassRatio()** and **DecreaseByPassRatio()**. Three other classes, which are **PassengerPlane**, **FighterJet** and **CargoPlane** inherits from class **Turbofan**.

Extend Figure Q4 to include classes **Turbofan, PassengerPlane, FighterJet** and **CargoPlane**, as per the abovementioned specifications. You need not redraw the entire Figure Q4. Just focus on the new classes and its relationship with the current class (or classes) in Figure Q4.

[6 marks]

(c) Consider the following voltage analysis method (i.e., function):

This method opens a log (i.e., text) file and reads the pre-recorded current and resistance values in this file. The current and resistance values are stored in a row format (i.e., one row contains a pair of current and resistance values). There is no restriction on the number of rows in the log file.

For each pair of current and resistance values read, the method then computes the voltage by multiplying these values.

If the computed voltage falls within the range of 100 and 1000 volts, this method increases a counter (which is initialized to zero). If the counter exceeds 50, this method prints out a warning message, closes the log file and exits immediately. Otherwise, the method continues to read the following current and resistance values in the log file, and repeats the voltage calculation, range and counter check until the last element of the log file is read, after which this method closes the log file and exits.

Based on the description above, draw a flow chart of this method. Apply the necessary common flowchart shapes and symbols.

Note: Voltage (V) = Current (I) × Resistance (R)

[6 marks]

End of Paper